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USPT,JPAB,EPAB,DWPI,TDBD	((barcod\$3 or bar cod\$3)and (label same image\$1) and user identification) and glyph\$1	0	<u>L7</u>
USPT,JPAB,EPAB,DWPI,TDBD	(((barcod\$3 or bar cod\$3)and (label same image\$1)) and glyph\$1)	28	<u>L6</u>
USPT,JPAB,EPAB,DWPI,TDBD	L2 and glyph\$1	28	<u>L5</u>
USPT,JPAB,EPAB,DWPI,TDBD	L3 and glyph\$1	0	<u>L4</u>
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USPT,JPAB,EPAB,DWPI,TDBD	barcod\$3 or bar cod\$3	43970	<u>L1</u>

09/192,014

WEST**Generate Collection****Search Results - Record(s) 1 through 20 of 20 returned.** **1. Document ID: US 6266651 B1**

L3: Entry 1 of 20

File: USPT

Jul 24, 2001

US-PAT-NO: 6266651

DOCUMENT-IDENTIFIER: US 6266651 B1

TITLE: Facilitating electronic commerce through two-tiered electronic markets and auctions

DATE-ISSUED: July 24, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Woolston; Thomas G.	Alexandria	VA		

US-CL-CURRENT: 705/27[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Claims](#) | [KWMC](#) | [Drawn Descr](#) | [Image](#) **2. Document ID: US 6202051 B1**

L3: Entry 2 of 20

File: USPT

Mar 13, 2001

US-PAT-NO: 6202051

DOCUMENT-IDENTIFIER: US 6202051 B1

TITLE: Facilitating internet commerce through internetworked auctions

DATE-ISSUED: March 13, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Woolston; Thomas G.	Alexandria	VA	22309	

US-CL-CURRENT: 705/27; 705/26, 705/37[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Claims](#) | [KWMC](#) | [Drawn Descr](#) | [Image](#) **3. Document ID: US 6192165 B1**

L3: Entry 3 of 20

File: USPT

Feb 20, 2001

US-PAT-NO: 6192165

DOCUMENT-IDENTIFIER: US 6192165 B1

TITLE: Apparatus and method for digital filing

DATE-ISSUED: February 20, 2001

INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Irons; Steven W.

Phoenix

AZ

US-CL-CURRENT: 382/306; 707/104.1, 707/500

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Claims](#) | [KWMC](#) | [Drawn Desc](#) | [Image](#)

4. Document ID: US 6091956 A

L3: Entry 4 of 20

File: USPT

Jul 18, 2000

US-PAT-NO: 6091956

DOCUMENT-IDENTIFIER: US 6091956 A

TITLE: Situation information system

DATE-ISSUED: July 18, 2000

INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Hollenberg; Dennis D.

Ventura

CA

93001

US-CL-CURRENT: 455/456; 455/557, 455/566

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Claims](#) | [KWMC](#) | [Drawn Desc](#) | [Image](#)

5. Document ID: US 6085176 A

L3: Entry 5 of 20

File: USPT

Jul 4, 2000

US-PAT-NO: 6085176

DOCUMENT-IDENTIFIER: US 6085176 A

TITLE: Method and apparatus for using search agents to search plurality of markets for items

DATE-ISSUED: July 4, 2000

INVENTOR-INFORMATION:

NAME

CITY

STATE

ZIP CODE

COUNTRY

Woolston; Thomas G.

Alexandria

VA

US-CL-CURRENT: 705/37; 705/16, 705/26, 705/44

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [KWMC](#) | [Drawn Desc](#) | [Image](#)

6. Document ID: US 6081750 A

L3: Entry 6 of 20

File: USPT

Jun 27, 2000

US-PAT-NO: 6081750

DOCUMENT-IDENTIFIER: US 6081750 A

TITLE: Ergonomic man-machine interface incorporating adaptive pattern recognition based control system

DATE-ISSUED: June 27, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven Mark	Yonkers	NY	10701-1705	
Hoffberg-Borghesani; Linda Irene	Acton	MA	01720	

US-CL-CURRENT: 700/17; 345/520, 700/11, 700/56, 700/83, 700/86[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#)[KWMIC](#) [Drawn Desc](#) [Image](#)

 7. Document ID: US 5950632 A

L3: Entry 7 of 20

File: USPT

Sep 14, 1999

US-PAT-NO: 5950632

DOCUMENT-IDENTIFIER: US 5950632 A

TITLE: Medical communication apparatus, system, and method

DATE-ISSUED: September 14, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Reber; William L.	Schaumburg	IL		
Perttunen; Cary D.	Shelby Township	MI		

US-CL-CURRENT: 128/898; 128/903, 128/904, 128/920, 340/7.56[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#)[KWMIC](#) [Drawn Desc](#) [Image](#)

 8. Document ID: US 5920477 A

L3: Entry 8 of 20

File: USPT

Jul 6, 1999

US-PAT-NO: 5920477

DOCUMENT-IDENTIFIER: US 5920477 A

TITLE: Human factored interface incorporating adaptive pattern recognition based controller apparatus

DATE-ISSUED: July 6, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	Yonkers	NY	10701-1705	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 382/181; 382/190, 700/83

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)

[KOMC](#) | [Drawn Desc](#) | [Image](#)

9. Document ID: US 5903454 A

L3: Entry 9 of 20

File: USPT

May 11, 1999

US-PAT-NO: 5903454

DOCUMENT-IDENTIFIER: US 5903454 A

TITLE: Human-factored interface corporating adaptive pattern recognition based controller apparatus

DATE-ISSUED: May 11, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Linda Irene	Acton	MA	01720	
Hoffberg; Steven M.	West Harrison	NY	10604	

US-CL-CURRENT: 700/83; 382/155, 700/45, 700/86

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)

[KOMC](#) | [Drawn Desc](#) | [Image](#)

10. Document ID: US 5901246 A

L3: Entry 10 of 20

File: USPT

May 4, 1999

US-PAT-NO: 5901246

DOCUMENT-IDENTIFIER: US 5901246 A

TITLE: Ergonomic man-machine interface incorporating adaptive pattern recognition based control system

DATE-ISSUED: May 4, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	Yonkers	NY	10701-1705	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 382/209

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)[KMC](#) | [Drawn Desc](#) | [Image](#) **11. Document ID: US 5875108 A**

L3: Entry 11 of 20

File: USPT

Feb 23, 1999

US-PAT-NO: 5875108

DOCUMENT-IDENTIFIER: US 5875108 A

TITLE: Ergonomic man-machine interface incorporating adaptive pattern recognition based control system

DATE-ISSUED: February 23, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	Yonkers	NY	10701-1705	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 700/17; 382/181, 382/190, 700/83[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)[KMC](#) | [Drawn Desc](#) | [Image](#) **12. Document ID: US 5867386 A**

L3: Entry 12 of 20

File: USPT

Feb 2, 1999

US-PAT-NO: 5867386

DOCUMENT-IDENTIFIER: US 5867386 A

TITLE: Morphological pattern recognition based controller system

DATE-ISSUED: February 2, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	Yonkers	NY	10701-1705	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 700/83; 382/190, 382/203, 382/209[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)[KMC](#) | [Drawn Desc](#) | [Image](#) **13. Document ID: US 5845265 A**

L3: Entry 13 of 20

File: USPT

Dec 1, 1998

US-PAT-NO: 5845265
DOCUMENT-IDENTIFIER: US 5845265 A

TITLE: Consignment nodes

DATE-ISSUED: December 1, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Woolston; Thomas G.	Arlington	VA		

US-CL-CURRENT: 705/37; 705/27

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)

[KOMC](#) | [Drawn Desc](#) | [Image](#)

14. Document ID: US 5774357 A

L3: Entry 14 of 20

File: USPT

Jun 30, 1998

US-PAT-NO: 5774357

DOCUMENT-IDENTIFIER: US 5774357 A

TITLE: Human factored interface incorporating adaptive pattern recognition based controller apparatus

DATE-ISSUED: June 30, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffberg; Steven M.	West Harrison	NY	10604	
Hoffberg-Borghesani; Linda I.	Acton	MA	01720	

US-CL-CURRENT: 713/600; 348/110, 348/27, 348/734, 712/240, 712/245

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)

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15. Document ID: US 5555101 A

L3: Entry 15 of 20

File: USPT

Sep 10, 1996

US-PAT-NO: 5555101

DOCUMENT-IDENTIFIER: US 5555101 A

TITLE: Forms creation and interpretation system

DATE-ISSUED: September 10, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Larson; Joseph C.	Rancho Santa Fe	CA		
Faul; J. Joel	Encinitas	CA		

US-CL-CURRENT: 358/403; 358/400, 358/442, 358/468, 382/287

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)

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16. Document ID: US 5504315 A

L3: Entry 16 of 20

File: USPT

Apr 2, 1996

US-PAT-NO: 5504315

DOCUMENT-IDENTIFIER: US 5504315 A

TITLE: Means and method for non-contact bar code label verification

DATE-ISSUED: April 2, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hardesty; John	Ervine	CA		
Barkan; Edward	South Setauket	NY		
Barkan; Christina S.	South Setauket	NY		
Fletcher; Dean	Mission Viejo	CA		
Almeida; Timothy	Santa Ana	CA		

US-CL-CURRENT: 235/454; 235/437[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)[KMC](#) | [Drawn Desc](#) | [Image](#) 17. Document ID: US RE34429 E

L3: Entry 17 of 20

File: USPT

Nov 2, 1993

US-PAT-NO: RE34429

DOCUMENT-IDENTIFIER: US RE34429 E

TITLE: Interactive facsimile system and method of information retrieval

DATE-ISSUED: November 2, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Baran; Paul	Atherton	CA	94025	
Baran; David F.	Berkeley	CA	94703	

US-CL-CURRENT: 379/100.11; 358/468, 379/100.07[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#)[KMC](#) | [Drawn Desc](#) | [Image](#) 18. Document ID: US 5218190 A

L3: Entry 18 of 20

File: USPT

Jun 8, 1993

US-PAT-NO: 5218190
DOCUMENT-IDENTIFIER: US 5218190 A

TITLE: Means and method for non-contact bar code label verification

DATE-ISSUED: June 8, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hardesty; John	Ervine	CA		
Barkan; Edward	South Setauket	NY		
Barkan; Christina S.	South Setauket	NY		
Fletcher; Dean	Mission Viejo	CA		
Almeida; Timothy	Santa Ana	CA		

US-CL-CURRENT: 235/462.01; 235/437

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [KDDC](#) | [Drawn Desc](#) | [Image](#)

19. Document ID: US 5041789 A

L3: Entry 19 of 20

File: USPT

Aug 20, 1991

US-PAT-NO: 5041789

DOCUMENT-IDENTIFIER: US 5041789 A

TITLE: Magnetic-resonance instrument employing barcode experiment specification

DATE-ISSUED: August 20, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Keller; Tony	Reinstetten-Forchheim			DEX
Laukien; Gunther R.	Rheinstetten			DEX
Spraul; Manfred	Ettlingen			DEX

US-CL-CURRENT: 324/318; 324/322

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [KDDC](#) | [Drawn Desc](#) | [Image](#)

20. Document ID: US 4893333 A

L3: Entry 20 of 20

File: USPT

Jan 9, 1990

US-PAT-NO: 4893333
DOCUMENT-IDENTIFIER: US 4893333 A

TITLE: Interactive facsimile system and method of information retrieval

DATE-ISSUED: January 9, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Baran; Paul	Atherton	CA	94025	
Baran; David F.	Berkeley	CA	94703	

US-CL-CURRENT: 379/100.11, 358/403, 358/468, 379/100.07, 379/905

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [KOMC](#) | [Drawn Desc](#) | [Image](#)

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Terms	Documents
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DataGlyph

[Google Search](#)[I'm Feeling Lucky](#)[Web](#) [Images](#) [Groups](#) [Directory](#)Searched the web for **DataGlyph**

Results 1 - 10 of about 524. Search took 0.17 seconds.

Dataglyph Main

Site Construction by Travis Chamberlain. All images featured in this site

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www.dataglyph.com/ - 7k - [Cached](#) - [Similar pages](#)

Dataglyph Profile

... DataGlyph was founded in 1989 with the aim of providing the Software Industry with hi-level visual interface design. Since then we have consulted with ...

www.dataglyph.com/Profile.htm - 10k - [Cached](#) - [Similar pages](#)

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DataGlyphs Technology

... from people and return it directly under an electronic format through **Dataglyph**

controls (checkboxes, signatures, and clip regions on a **Dataglyph** document). ...

www.xrce.xerox.com/showroom/techno/dataglyp.htm - 13k - [Cached](#) - [Similar pages](#)

Xerox DataGlyphs

... Create Your Own **DataGlyph**. An online GlyphServer provides a limited demonstration of the technology. Use it to encode or decode arbitrary information in a ...

www.dataglyphs.com/ - 6k - [Cached](#) - [Similar pages](#)

DataGlyph Toolkit 3.1 API

DataGlyph Toolkit 3.1 API. Types. DgCallocType, DgContext, Public context data structure that encapsulates state for a series... ...

www.dataglyphs.com/api/ - 17k - [Cached](#) - [Similar pages](#)

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XSiS Dataglyph Codes

... **DataGlyph** technology allows ordinary business documents to carry thousands of characters of information hidden in these unobtrusive gray patterns that can ...

www2.xerox.com/xsis/dataglyph.htm - 12k - [Cached](#) - [Similar pages](#)

XSiS Customer Profiles

... One of the first commercial applications for the use of **DataGlyph** codes is in the medical x-ray industry. Merge Technologies Inc. with XSiS has produced a hand ...

www2.xerox.com/xsis/cust2pro.htm - 13k - [Cached](#) - [Similar pages](#)

[More results from www2.xerox.com]

alphaAve.com | Details-DataGlyphs

... can provide security, identification and other embedded information. The Xerox **DataGlyph** Toolkit provides a means of generating glyph blocks from arbitrary ...

www.alphaavenue.com/details.php?tech=DataGlyphs - 12k - [Cached](#) - [Similar pages](#)

XReader High Speed DataGlyph Reader for Xero

... XReader High Speed **DataGlyph** Reader for Xero. ... Note: The real size of the smaller **DataGlyph** is 1/4 inch on a side. ...

www.fsiautomation.com/xreader_high_speed_dataglyph_reader.htm - 9k - [Cached](#) - [Similar pages](#)

89/192,014

[PDF] XReaderTM Vision System

File Format: PDF/Adobe Acrobat

... System XReaderTM is a digital vision system for high-speed reading of DataGlyph,

OCR, DataMatrix, barcodes, postmarks, and other marks and patterns on high ...

www.fsiautomation.com/Downloads/XReader%20Datasheet%20.pdf - [Similar pages](#)[[More results from www.fsiautomation.com](#)]Result Page: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [Next](#)[DataGlyph](#)[Google Search](#)[Search within results](#)Unsatisfied with your results? [Help us improve.](#)Try your query on: [AltaVista](#) [Excite](#) [HotBot](#) [Lycos](#) [Yahoo!](#)[Google Home](#) - [Advertise with Us](#) - [Add Google to Your Site](#) - [News and Resources](#) - [Language Tools](#) - [Jobs](#),
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Seybold Report on Desktop Publishing, Vol 9, No 5



1. Xerox touts DataGlyphs for paper data

Xerox touts DataGlyphs for paper data

SmartPaper documents mix text, images and machine-readable code

However successful electronic document distribution may become, Xerox believes that paper will remain the medium of choice for years to come. It has therefore developed an interesting technique for printing binary data on paper. Called SmartPaper, the scheme allows a document (whose primary function is to carry human-readable information) to carry machine-readable information in a form that does not offend readers' sensibilities.

The data-carrying elements in SmartPaper, which Xerox calls DataGlyphs, are small line segments that slope either to the left or the right, depending on whether they encode a 1 or a 0 (*see diagram*). An ordinary office printer can record them, and ordinary office scanners can easily distinguish the segments. Seen at normal viewing distances, however, the segments merge into a uniform gray area that is very similar to an ordinary halftone tint.

A region of this gray matter can be treated as a design element on the page, or it can just be tucked away in a corner. It is typically separate from the type and graphics, but can be overprinted provided that the proportion of DataGlyphs that are obscured is not too large. A scanned image of a page containing DataGlyphs can then be interpreted by Xerox's SmartPaper software.

Paper is here to stay. Xerox is marketing SmartPaper because of paper's various advantages:

- **Paper is durable.** Magnetic tape, if it is treated gently and retensioned at regular intervals, can hold data for a couple of years. Optical discs are guaranteed for ten years, and probably have a lifetime approaching 50 years. Paper remains readable for hundreds of years.
- **Paper is reliable.** Although information on paper can be damaged, the damage is usually obvious. Often the information can be recovered, at least partially.
- **Paper is legal.** There is a huge body of law and tradition—contracts, checks, tax records, etc.—governing paper documents. The validity of computer evidence is largely untested.

On the other hand, from a computer's viewpoint, paper is terrible because it's hard to extract information from it. Elegant fonts and low-resolution printers make OCR unreliable. (A good OCR product achieves 99% accuracy, which might be OK for ordinary text but is useless for executable instructions.)

Furthermore, office documents are subject to many forms of degradation: coffee rings, ink smudges, staples, tearing, folding, spindling and mutilating.

Bulletproof. In developing SmartPaper, Xerox sought an approach that was robust enough to survive such office hazards. The process it settled on has three steps:

- **Error-correcting coding.** The binary data are embedded in an error-correcting code. Such codes place redundant bits in the data stream, sacrificing compactness for reliability. Depending on the hazard level that is anticipated, the value of the information and the available space, different amounts of redundancy can be used.
- **Scattering.** The encoded bytes are reordered in a pseudorandom way, scattering the data uniformly over the

entire block. Thus, even if some portion of the page is obliterated, when the block is reconstructed (by reversing the scatter), the damage will be distributed throughout the entire data stream. Then, because each data segment is only partially damaged, the error-correcting codes have a chance to recover the information.

- **Blocking.** The scattered bits are grouped into blocks, to which framing and synchronization codes are added. The blocks are then printed, possibly with dummy glyphs to fill out unused space within the rectangle that the page designer has assigned.

Xerox representatives demonstrated the reliability of SmartPaper to us in a dramatic way. Picking up a page containing a region of DataGlyphs, they tore it in half right through the gray area. They then scanned the half-page. The software recovered all of the original data. In another test, we scribbled over a data region with a ballpoint pen. Again, the software had no trouble.

Obviously, if enough of the glyphs were damaged, the system would fail. However, the failure would be obvious to the software, which would flag the problem, thus preventing insidious undetected computer errors.

Better than bar codes. There is already a common technology for printing machine-readable data on paper, namely bar codes. Xerox claims that SmartPaper is superior to bar codes in several ways.

- **Flexibility.** The DataGlyph format is resolution-independent. It can be printed at 200 dpi for fax transmission or at 600 dpi on the latest laser printers. Going beyond 600 dpi is not practical, we were told. First, this is intended as an office technology and few offices keep a drum scanner around. But even with a good printer and scanner, most office paper surfaces cannot hold smaller details.
- **Data density.** Xerox says that DataGlyphs can carry 128 bytes per square inch at 200 dpi, and up to a kilobyte per square inch at 600 dpi. In contrast, linear bar codes typically offer 24–40 bytes per square inch, we were told. Two-dimensional bar codes also exist; Xerox claims that at the same resolution and error-correction level, DataGlyphs take only 60% as much space as 2D bar codes.
- **Aesthetics.** Bar codes are ugly and obvious. For example, experiments with direct mail have indicated that putting a bar code on a reply card can depress the response rate as much as 1%. DataGlyphs, in contrast, are quite inoffensive. At normal reading distance, a data area is a uniform gray. Close up, it is a random pattern of 45° diagonal lines. Xerox said that it chose this pattern because research showed it was the most pleasing to the eye.

SmartPaper Controls. DataGlyphs can carry any binary data, including executable commands for the computer that is reading the document. Expecting that a logical use of SmartPaper will be for office forms, Xerox has defined a set of SmartPaper Controls that can be embedded in the DataGlyphs. They allow the forms designer to specify areas on the page with special properties. These include:

- **Check boxes.** The software can be instructed to detect the presence or absence of marks within certain boundaries. This allows people to choose from several options by writing checkmarks on a form.
- **Signature regions.** Similarly, the software can try to verify whether a form has been signed. It can easily tell if the signature space is blank. It cannot really tell whether the signature is valid, but it does look for the characteristic squiggles of handwriting.
- **Clip regions.** The reader program treats everything in a clip region as a bitmap image. The idea is that the person filling out the form can put a drawing in such an area. Auto-accident reports, for example, commonly require such drawings. The drawing can be stored with the electronic version of the form, passed along to other programs for interpretation, etc.

Windows toolkit. Xerox's SmartPaper technology is available to application developers in the form of a software toolkit for Windows 3.1. It includes an API for C and C++, a set of DLLs and drivers, and sample OLE servers. Licensing terms, as is usual with OEM software, depend on volume and product type.

For today's desktop computers, the SmartPaper reader is a tad unwieldy; it requires at least 6 MB of RAM and a buffer that's twice the size of the scanned document. However, RAM is getting cheaper at a steady pace, so we

don't see this as a real barrier.

- Xerox sees lots of uses for SmartPaper: forms, direct mail, document publishing and others that its licensees will think of. Any application where documents must be sent out and returned, where computer data (such as file names or revision codes) must accompany human-readable information or where paper must be saved for legal reasons is a likely candidate.

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